



Innovative Power Transmission



Gear Units for LNG Carriers
Dual-Fuel/Electric Propulsion

Customized gear units for LNG carriers

Dual-fuel/electric propulsion

RENK marine gear units from Rheine #1 for LNG tankers

RENK AG is among the world's foremost manufacturers of marine gear systems and its plant at Rheine, Germany, which specializes in single- and twin-engine gear units as well as propeller shaft clutches, is a highly favored partner when it comes to developing innovative marine gear solutions for LNG tankers. The majority of all LNG tankers built with a dual-fuel-diesel-electric propulsion system (DFDE) are using single and double marine gear units from RENK. Double gear units are designed with centre distances up to 4.400mm. Here two electric motors are combined by one double gear unit and provide a power of up to 30.000kW to the fixed-pitch-propeller.

On the latest generation of LNG tankers with two independent propulsion systems for much greater redundancy, RENK single marine gear units reliably transfer the power from the electric motors to the fixed-pitch-propellers. Single marine gear units are designed with centre distances up to 2.200mm and provide a power of propulsion up to 14.000kW.

RENK's presence in this market is also reflected in customers' regular use of the slide bearings sourced from the Hannover plant and installed in the onboard generators and electric motors. These bearings are thousandfold proven in container vessels, tankers, service craft, and ferries.

Ongoing R&D on future marine propulsion systems backed by a century of experience is an assurance of innovative products: state-of-the-art technology gained from knowledge fueled by tradition. RENK is an active member of FVA, Germany's R&D association for the propulsion sector, and works with universities and research institutes. This allows access to the newest research results. Superior technology and professional advice are our hallmark. And the benefits for our customers? They acquire state-of-the-art technology and top-class expertise in consultancy and service.



GDF Suez Neptune, © Ship-owner





Assembly of an NDSH-3920 double marine gear unit



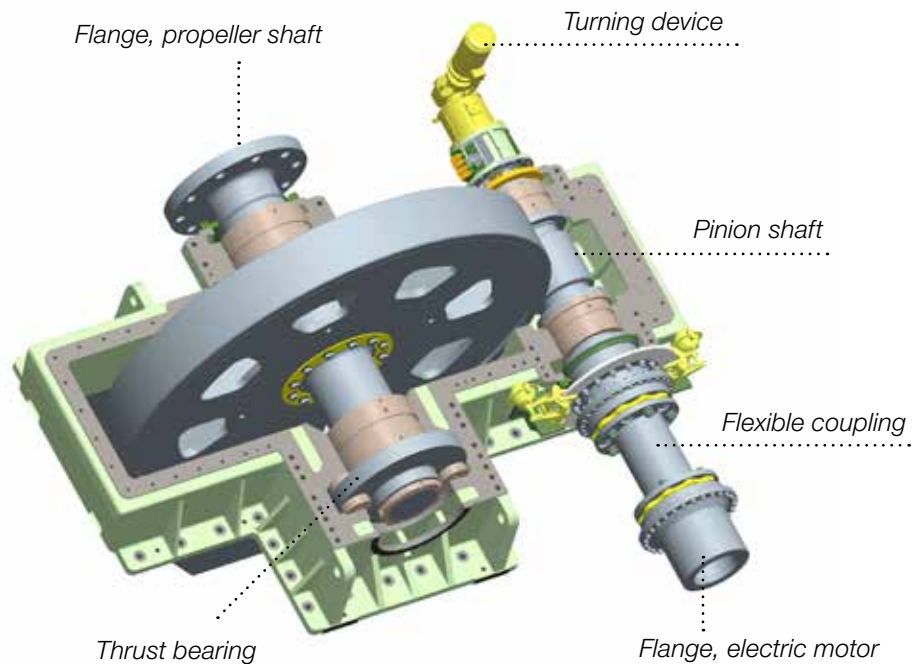
RSH: simply superior

Single input/output

RSH are single-stage marine reduction gear units with one input and one output shaft. In most cases they are custom-made and increasingly being installed on twin screw LNG carriers with a dual-fuel-diesel-electric (DFDE) propulsion system.

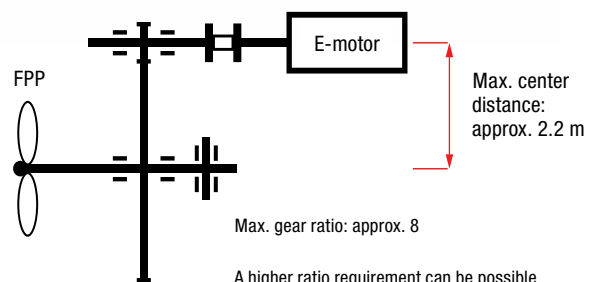
Customer benefit with a RENK single marine gear unit:

- from an engineering for unlimited life-time,
- from a for his needs tailor-made efficient gearbox solution,
- from a marine gear unit designed to reach the intended propeller speeds for optimized propulsion efficiency,
- from a marine gear unit with wear free slide bearings.



Ship's name:
 BW GDF Suez Paris
 Owner: BW Gas
 Builder: Daewoo Ship-
 building & Marine Engineering
 (DSME), Korea

Technical data
 RSH-1950
 Rating: 12,050 kW
 Speed: 640/78.5 rpm
 Classification: DNV

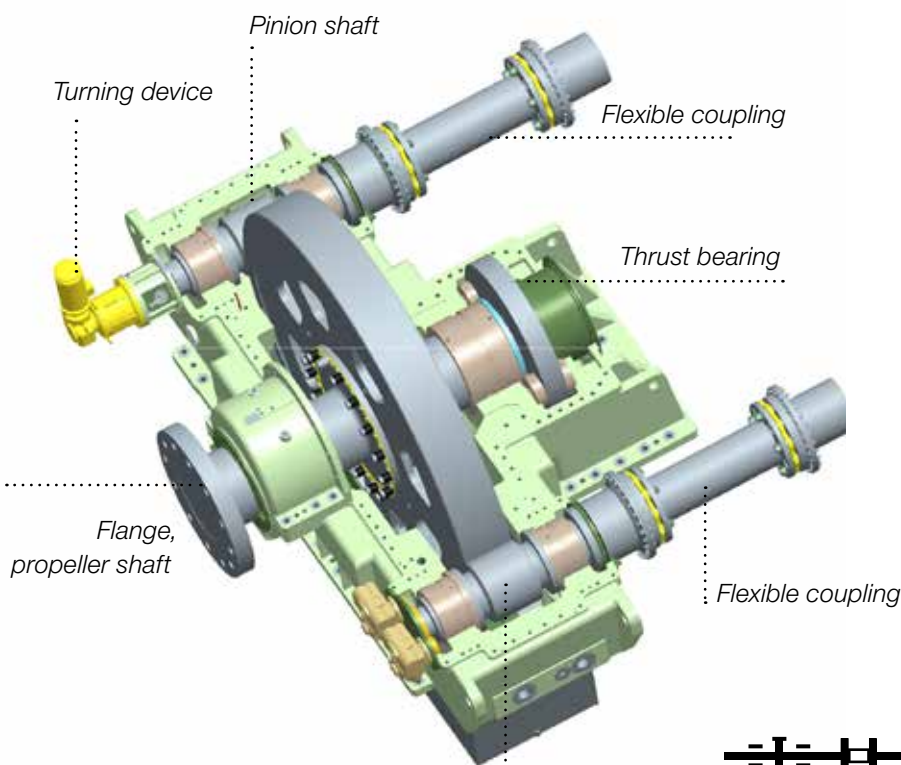


A higher ratio requirement can be possible and need to be checked for each specific case individually.



NDSH: double the value

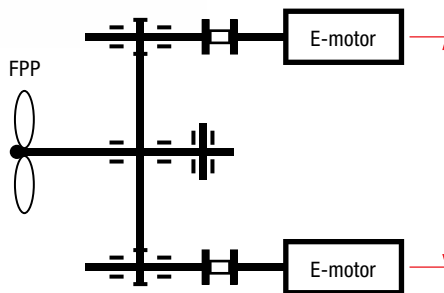
Double input/single output single stage



NDSH are single-stage marine reduction gear units with two input and one output shaft. Normally they are custom-made and installed on single screw LNG carriers with a dual-fuel-diesel-electric (DFDE) propulsion system. The customer gains from all the benefits as from the RSH series.

Ship's name: Soyo
 Owner: MINT (Mitsui & Co., Ltd., NYK Line, Teekay Corporation)
 Builder: Samsung Heavy Industries (SHI), Korea

Technical data
 NDSH-3900
 Rating: 2x13,600 kW
 Speed: 700/87.0 rpm
 Classification: ABS



Max. center distance:
 approx. 4.4 m

Max. gear ratio:
 approx. 8

A higher ratio requirement can be possible and need to be checked for each specific case individually.



NDSH and RSH: ultimate reliability

Even under the iciest conditions



Here we have the first ice-class LNG carrier with dual-fuel-diesel-electric (DFDE) propulsion. The 173,400 m³ LNG carrier has been built to comply with DNV, Ice 1A. Her owner is the Norwegian company Knutsen OAS Shipping, the shipbuilder Daewoo Shipbuilding & Marine Engineering (DSME). Her name is Ribera Del Duero Knutsen.

The propulsion system is twin screw, with for each drive train a single RSH-2050 marine gear unit and horizontally offset shafts; the gears transmit dependably and economically the 13,600 kW from the electric motors to the propeller shaft and, in the process, reduce the speed from 610 to 78 rpm.



Design concept:

- Very compact design,
- Very stiff housing,
- High addendum toothing,
- Minimized shaft centre distance,
- Integrated thrust bearing at motor side

Case hardened tothing:

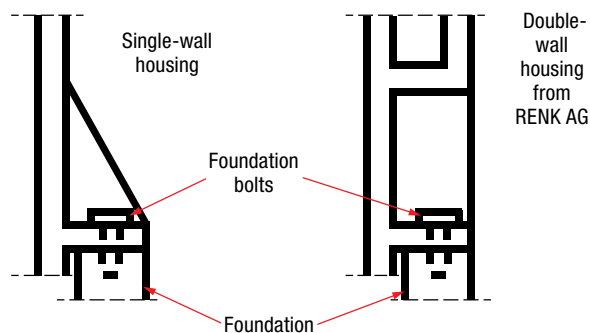
- Decrease of pinion and main wheel diameter,
- Reduction of tothing width,
- Reduction of shaft centre distance

Marine gear units from RENK feature precision-machined load-adjusted tooth gearing, very quiet rotations under full and part loads and hence an extended durability.

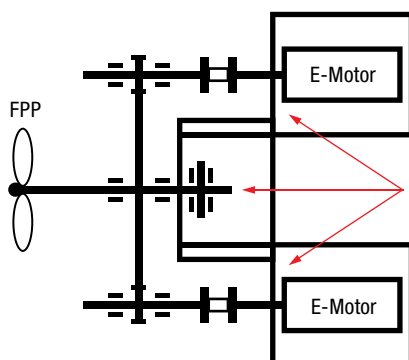
RENK is the only manufacturer with a high addendum toothing on marine gears. The advantage is that the higher tooth results in longer tooth contact, greater overlap, a more compact design, less noise and vibration.

For maximum stiffness, their housing is double walled. Critical spots are computed according to the finite element method. The corresponding results are used to optimize the design and construction accordingly.

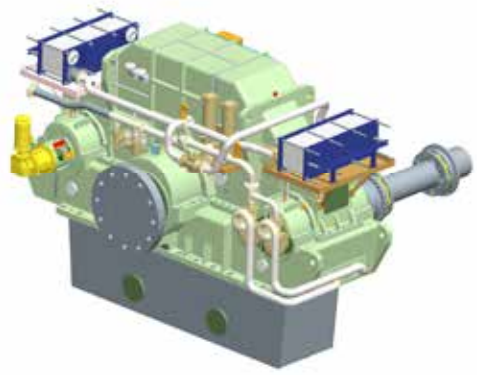
Double-wall design



Thrust bearing: electric motor side



Combined foundation
Thrust bearing
+ electric motor
Common U-frame
Enhanced stiffness!



Customized accessories



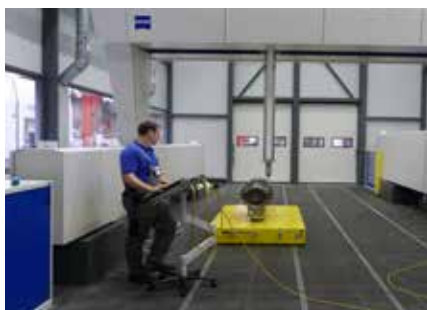
RENK supplies customized accessories for all applications.

- (1) Standby pumps (stand-alone)
- (2) Double filters
- (3) Turning devices
- (4) Gear-driven pumps
- (5) Plate coolers
- (6) Flexible couplings
- (7) Disk brakes
- (8) CJC filters

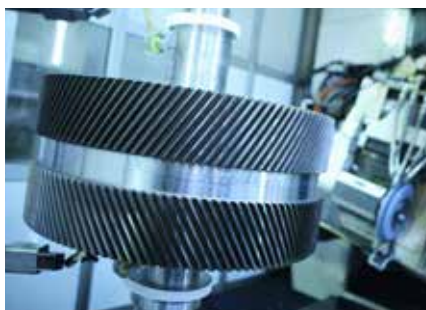


Modern manufacturing processes and zero-compromise quality assurance

At the production plants, RENK uses the latest manufacturing equipment. This includes CNC machining centers for form grinding tooth flanks of up to 4.2 m workpiece diameter and hardening techniques for gearwheels of up to 3.2 m diameter. Preventive monitoring methods are applied in order to ensure a constant high product quality. Right from the start, RENK applies Failure Mode and Effects Analysis (FMEA) in order to detect possible sources of error and eliminate them at the earliest possible stage.



Three-coordinate measuring machine



Trial run and back-to-back test

Ongoing measurements verify and document product quality. Finished components must first undergo a test run under load before leaving the plant. Our quality management system is certified to the latest DIN EN ISO 9001/2001. All this assures customers that RENK is supplying them products of superlative quality, dependability, and operational reliability.



References

NDSH-4000

*Gear units for 155,000 m³/177,000 m³
LNG carriers
Single-screw
Propulsion: DFDE
P = 2×14,860 kW
n = 720/90.6 rpm
i = 7.950 : 1
Shipowner:
BP Shipping, 155,000 m³
Teekay, 155,000 m³
MOL, 177,000 m³
Shipyard:
Hyundai Heavy Industries
Hyundai Samho Heavy Industries*



Installing the big wheel (diameter around 3,600 mm) of an NDSH-4000 double marine gear unit for a BP LNG tanker

*Ship's name:
British Emerald
Owner:
BP Shipping
Builder:
Hyundai Heavy
Industries (HHI), Korea*

Technical data
*Model: NDSH-4000
Rating: 2×14,860 kW
Speed: 720/90.6 rpm
Classification: LRS*



For more than 100 LNG carriers, shipyards and owners trusting the proven reliability of RENK marine gear units (NDSH-3800 to NDSH-4200 and RSH-1950 to RSH-2050)



LNG carriers built at Daewoo Shipbuilding & Marine Engineering (DSME) for:

BW Gas, Knutsen OAS Shipping, Maran Gas Maritime Inc., Awilco LNG, Excelerate Energy (FSRU)

LNG carriers built at Samsung Heavy Industries (SHI) for:

Maersk LNG, Gaslog Ltd., Chevron, Höegh LNG (SRV), BG Group, Mitsui & Co., Ltd., NYK Line, Teekay Corporation, Golar LNG, Thenamaris Ships Management Inc.

LNG carriers built at Hyundai Heavy Industries (HHI)/Hyundai Samho Heavy Industries (HSHI) for:

BP, Teekay Corporation, Mitsui O.S.K. Lines, Dynagas Ltd., Sea Tanker Group (Golar LNG), Oman Shipping Company S.A.O.C., Maran Gas Maritime Inc., Höegh LNG (FSRU), BW Gas

LNG carriers built at STX Offshore & Shipbuilding (STX) for:

Sovcomflot (SCF Unicom), Alpha Tankers & Freighters International Ltd.

LNG carriers built at Mitsubishi Heavy Industries (MHI) for:

MISC Berhad



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